



Overview

Location: Hanover, PA
 Building type(s): K-12 education
 New construction
 43,600 sq. feet (4,050 sq. meters)
 Project scope: 2-story building
 Suburban setting
 Anticipated completion date:
 December 2002
 Rating: U.S. Green Building Council LEED-NC, v.2/v.2.1--Level: Gold (42 points)
 Rating: Green Building Challenge --Level: 2.7 in GB Tool 1.76



Photo credit: © Jim Schafer Location Photography

The Clearview Elementary School in Hanover, Pennsylvania is a 43,000 square foot new construction project. The new school replaces an existing facility at the same location and serves kindergarten through grade 4.

Environmental Aspects

Some project highlights include building commissioning, a building integrated sundial, a 30% reduction in water use, a 40% reduction in energy use, detailed attention to materials selection, superior indoor air quality, controllable building systems, and construction waste management.

The school district has further committed to augmenting its curriculum to include the lessons that the building teaches. The district will also conduct a student performance study in partnership with a local university to compare test results in this daylight facility with test results in its other elementary schools.

Owner & Occupancy

Owned and occupied by Hanover Public School District, Local government
 Typically occupied by 378 people, 45 hours per person per week

This public elementary school is occupied approximately 44 weeks per year.

Building Programs

Indoor Spaces: Classroom (66%), Circulation (15%), Cafeteria (6%), Gymnasium (6%), Public assembly (6%), Mechanical systems (4%), Restrooms (3%), Lobby/reception (2%), Office (2%), Electrical systems (2%), Conference (1%), Medical treatment (1%)

Outdoor Spaces: Other (75%), Drives/roadway (10%), Parking (9%), Playground (3%), Patio/hardscape (2%), Pedestrian/non-motorized vehicle path (1%)

Keywords

Integrated team, Design charrette, Training, Simulation, Green specifications, Commissioning, Operations and maintenance, Indigenous vegetation, Efficient fixtures and appliances, Drought-tolerant landscaping, Massing and orientation, Insulation levels, Glazing, Airtightness, Passive solar, HVAC, Lighting control and daylight harvesting, Efficient lighting, Adaptable design, Durability, Benign materials, Recycled materials, Local materials, C&D waste management, Occupant recycling, Connection to outdoors, Daylighting, Ventilation effectiveness, Moisture control, Thermal comfort, Noise control, Low-emitting materials, Indoor air quality monitoring

next topic:  Process

Clearview Elementary School

Overview

Process

Finance

Land Use

Site

Energy

Materials

Indoor Environment

Images

Ratings & Awards

Lessons

Learn More



Land Use & Community

Prior to construction, the site was a vacant lot adjacent to the existing elementary school, which will be retained intact for another occupancy.

Green Strategies

Properties with Excessive Impacts

- Avoid contributing to sprawl
- Avoid developing prime agricultural land
- Avoid building on a flood-prone property
- Avoid properties where damage to fragile ecosystems cannot be avoided
- Avoid properties with excessive slopes

Support for Appropriate Transportation

- Provide safe access for bicyclers and pedestrians
- Provide showers and changing areas for bicycle and pedestrian commuters
- Provide storage area for bicycles
- Provide vehicle access to support car and vanpooling

Property Selection Opportunities

- Select already-developed sites for new development

previous topic: [Finance](#)

next topic: [Site/Water](#)

Clearview Elementary School

[Overview](#)

[Process](#)

[Finance](#)

[Land Use](#)

[Site](#)

[Energy](#)

[Materials](#)

[Indoor Environment](#)

[Images](#)

[Ratings & Awards](#)

[Lessons](#)

[Learn More](#)

Case Studies hosted and managed courtesy of BuildingGreen, Inc.

Case Studies Database provided by the U.S. Department of Energy's

Building Technology Program, High Performance Buildings.



[About USGBC](#) | [Policies & Guidelines](#) | [Frequently Asked Questions](#) | [Contact](#)

Copyright © 2008 U.S. Green Building Council. All Rights Reserved.



Site Description

The site is nearly flat with maximum 3% slope. Vegetation consists primarily of grasses. All existing trees remain undisturbed. Disturbed soils consist of Bedford and Lawrenceville silt loam and "made land" consisting of sandy silt, silt, clayey sand, and silty sand fill materials. No surface aquifers exist, but a relatively high water table called for underdrains and foundation drainage. An existing municipal storm sewer underground pipe and right-of-way passes through the middle of the project site and was utilized for project stormwater conveyance.

Lot size: 19,828 ft²

Building footprint: 2,380 sq ft (221 sq meters)

Previously developed land



Photo credit: L. Robert Kimball & Associates

Water Conservation and Use

Clearview is expected to use over 30% less potable water than would a conventional school. This will be achieved through a combination of waterless urinals, low-flow faucets and showerheads, and push-button automatic faucet controls.

Water Data

Water Use

Indoor potable water use: 356,000 gal/yr (1,350,000 liters/yr)

Outdoor potable water use: 0 gal/yr (0 liters/yr)

Total potable water use: 356,000 gal/yr (1,350,000 liters/yr)

Potable water use per unit area: 8.17 gal/sq ft (333 liters/sq meter)

Green Strategies

Waterless Fixtures

Specify waterless urinals

Landscape Plantings

Landscape with indigenous vegetation

Plant trees to shade parked vehicles

Low-Water-Use Fixtures

Use automatic faucet controls for lavatories

Install showerheads using less than 2.2 gallons per minute

Demand for Irrigation

Select plants for drought tolerance



previous topic:

[Land Use](#)

next topic:

[Energy](#)

Clearview Elementary School

[Overview](#)

[Process](#)

[Finance](#)

[Land Use](#)

[Site](#)

[Energy](#)

[Materials](#)

[Indoor Environment](#)

[Images](#)

[Ratings & Awards](#)

[Lessons](#)

[Learn More](#)

Case Studies hosted and managed courtesy of [BuildingGreen, Inc.](#)

Case Studies Database provided by the U.S. Department of Energy's

Building Technology Program, High Performance Buildings.





U.S. GREEN BUILDING COUNCIL

- LEED
- Education
- Resources
- News & Events
- Committees
- Chapters
- Membership

Home / LEED / Project Certification / LEED Projects Directory / Certified Project List /

Energy

Clearview is expected to use 40% less energy than would a conventional school building that is minimally compliant with ASHRAE/IES Standard 90.1. This will be achieved through the use of insulated concrete forms, triple glazed windows, daylighting, indirect lighting, ground-source heat pumps, and an underfloor air system.

Energy performance has been modeled using PowerDOE at 23,628 Btu/ft²/yr.



Photo credit: © Jim Schafer Location Photography

Energy Data Set: Simulation: Units:

Annual Purchased Energy Use

Fuel	Quantity	Cost(\$)	MMBtu	kBtu/ft2	\$/ft2
Electricity	290,000 kWh		989	22.7	
Natural Gas	7,910 kWh		27	0.618	
Fuel Oil (No. 2, diesel)	0 kWh		0	0	
Biomass (wood or other)	0 kWh		0	0	
Other	0 kWh		0	0	

Total Annual Building Energy Consumption

Fuel	Quantity	Cost	MMBtu	kBtu/ft2	\$/ft2
Total Purchased			1,020	23.3	
Grand Total			1,020	23.3	

Annual End-Use Breakdown

End Use	Quantity	MMBtu	kBtu/ft2
Heating	65,600 kWh	224	5.14
Cooling	17,300 kWh	59	1.35
Lighting	46,600 kWh	159	3.64
Fans/Pumps	95,500 kWh	326	7.47
Plug Loads and Equipment	25,800 kWh	88	2.02
Vertical Transport			
Domestic Hot Water	7,910 kWh	27	0.618
Exterior Lighting	39,300 kWh	134	3.07

Clearview Elementary School

[Overview](#)

[Process](#)

[Finance](#)

[Land Use](#)

[Site](#)

[Energy](#)

[Materials](#)

[Indoor Environment](#)

[Images](#)

[Ratings & Awards](#)

[Lessons](#)

[Learn More](#)

Data Sources & Reliability

Simulation software

PowerDOE v1.17

Green Strategies

Wall Insulation

Achieve a whole-wall R-value greater than 25

Use spray-applied insulation in cavities with many obstacles or irregularities

Ground-coupled Systems

Use ground-source heat pumps as a source for heating and cooling

Solar Cooling Loads

Utilize heliodon studies to optimize shading strategies

Orient the building properly

Daylighting for Energy Efficiency

Use north/south roof monitors and/or clerestories for daylighting

Non-Solar Cooling Loads

Use operable windows

Interior Design for Light

Use light colors for surfaces and finishes

Cooling Systems

Size cooling equipment appropriately

Commission the HVAC system

Light Levels

Design for no more than 1.0 watts/square foot

Minimize outdoor lighting

Foundation Insulation

Use slab perimeter insulation with an insulating value of R-11 or greater

High-performance Windows and Doors

Use windows with a whole-unit U-factor less than 0.32 (greater than R-3.0)

Air Infiltration

Keep all mechanical, electrical and plumbing systems within the air and vapor barriers

Ventilation Systems

Use heat-recovery ventilation

Use demand-controlled ventilation

HVAC Distribution Systems

Consider using an access floor system

HVAC Controls and Zoning

Use direct digital control (DDC) systems

Roof Insulation

Achieve a whole-roof R-value of 25 or greater

◀ previous topic:
[Site/Water](#)

next topic: ▶
[Materials](#)

Case Studies hosted and managed courtesy of

BuildingGreen, Inc.

Case Studies Database provided by the U.S. Department of Energy's

Building Technology Program, High Performance Buildings.



[About USGBC](#) | [Policies & Guidelines](#) | [Frequently Asked Questions](#) | [Contact](#)

Copyright © 2008 U.S. Green Building Council. All Rights Reserved.



Materials & Resources

Building materials were selected based on life cycle analysis (LCA) comparisons considering their recycled content, recyclability, renewability, and the environmental or energy-consumption impact of their production processes. Basic comparisons were produced on BEES software and detailed analyses utilized Athena Environmental Impact Estimator software. Over 50% of the building materials, by cost, contain in aggregate, a minimum weighted average of 20% post-consumer or 40% post-industrial recycled content. Over 40% of all selected building materials are manufactured within 500 miles of the project site.



Photo credit: © Jim Schafer Location Photography

Diversion of Construction & Demolition Waste

The contractor was given specifications to divert over 50% of construction waste from the landfill. As executed, the construction waste management plan diverted over 75% of the construction waste.

Green Products Used

- High-Performance Window Glazing
- Permanent Concrete Forms
- Recycled-Content Cellulose Insulation
- Recycled-Content Structural High-Density Fiberboard Panels
- Recycled-Rubber Flooring
- Locally milled hemlock siding

Green Strategies

Plan for Materials Longevity

Use materials and systems with low maintenance requirements

Job Site Recycling

Require a waste management plan from the contractor

Design for Adaptability

Use an access floor to facilitate reconfiguring of spaces and cabling systems

Toxic Upstream or Downstream Burdens

Choose naturally rot-resistant wood species for exposed applications

Greenhouse Gas Emissions from Manufacture

Replace up to 30% of the cement in concrete with flyash

Post-Consumer Recycled Materials

- Use plastic toilet partitions made from recycled plastic
- Specify heavy steel framing with highest recycled content

Pre-Consumer Recycled Materials

- Use concrete masonry units with recycled or industrial-waste aggregates
- Use recycled-content rubber flooring
- Use agricultural-waste-fiber panels for millwork and interior finish

previous topic:
[Energy](#)

next topic:
[Indoor Env](#)

Clearview Elementary School

[Overview](#)
[Process](#)
[Finance](#)
[Land Use](#)
[Site](#)
[Energy](#)
[Materials](#)
[Indoor Environment](#)
[Images](#)
[Ratings & Awards](#)
[Lessons](#)
[Learn More](#)



Awards

NESEA Green Building Awards in 2003; Category/title: First Prize: Places of Learning
Slag Cement Association in 2004; Category/title: Best Use of Slag Cement for Sustainable Design
Sustainable Buildings Industry Council's Exemplary Sustainable Building Awards in 2004;
 Category/title: 2nd Place nationwide

Ratings

U.S. Green Building Council LEED-NC, v.2/v.2.1 in 2004; achievement level: Gold (42 points)

Sustainable Sites, 5 of 14 possible points

SS Prerequisite 1, Erosion & Sedimentation Control

SS Credit 1, Site Selection

SS Credit 4.2, Alternative Transportation, Bicycle Storage & Changing Rooms

SS Credit 4.4, Alternative Transportation, Parking Capacity

SS Credit 5.2, Reduced Site Disturbance, Development Footprint

SS Credit 7.2, Landscape & Exterior Design to Reduce Heat Islands, Roof

Water Efficiency, 4 of 5 possible points

WE Credit 1.1, Water Efficient Landscaping, Reduce by 50%

WE Credit 1.2, Water Efficient Landscaping, No Potable Water Use or No Irrigation

WE Credit 3.1, Water Use Reduction, 20% Reduction

WE Credit 3.2, Water Use Reduction, 30% Reduction

Energy and Atmosphere, 10 of 17 possible points

EA Prerequisite 1, Fundamental Building Systems Commissioning

EA Prerequisite 2, Minimum Energy Performance

EA Prerequisite 3, CFC Reduction in HVAC&R Equipment

EA Credit 1.1a, Optimize Energy Performance, 15% New 5% Existing

EA Credit 1.1b, Optimize Energy Performance, 20% New 10% Existing

EA Credit 1.2a, Optimize Energy Performance, 25% New 15% Existing

EA Credit 1.2b, Optimize Energy Performance, 30% New 20% Existing

EA Credit 1.3a, Optimize Energy Performance, 35% New 25% Existing

EA Credit 1.3b, Optimize Energy Performance, 40% New 30% Existing

EA Credit 1.4a, Optimize Energy Performance, 45% New 35% Existing

EA Credit 1.4b, Optimize Energy Performance, 50% New 40% Existing

EA Credit 1.5a, Optimize Energy Performance, 55% New 45% Existing

EA Credit 1.5b, Optimize Energy Performance, 60% New 50% Existing

Materials and Resources, 7 of 13 possible points

MR Prerequisite 1, Storage & Collection of Recyclables

MR Credit 2.1, Construction Waste Management, Divert 50%

MR Credit 2.2, Construction Waste Management, Divert 75%

MR Credit 4.1, Recycled Content: 5% (post-consumer + 1/2 post-industrial)

MR Credit 4.2, Recycled Content: 10% (post-consumer + 1/2 post-industrial)

MR Credit 5.1, Local/Regional Materials, 20% Manufactured Locally

MR Credit 5.2, Local/Regional Materials, of 20% Above, 50% Harvested Locally

MR Credit 6, Rapidly Renewable Materials

Indoor Environmental Quality, 11 of 15 possible points

EQ Prerequisite 1, Minimum IAQ Performance

EQ Prerequisite 2, Environmental Tobacco Smoke (ETS) Control

EQ Credit 1, Carbon Dioxide (CO₂) Monitoring

EQ Credit 2, Increase Ventilation Effectiveness

EQ Credit 4.1, Low-Emitting Materials, Adhesives & Sealants

EQ Credit 4.2, Low-Emitting Materials, Paints

EQ Credit 4.3, Low-Emitting Materials, Carpet

Clearview Elementary School

[Overview](#)

[Process](#)

[Finance](#)

[Land Use](#)

[Site](#)

[Energy](#)

[Materials](#)

[Indoor Environment](#)

[Images](#)

[Ratings & Awards](#)

[Lessons](#)

[Learn More](#)

EQ Credit 5, Indoor Chemical & Pollutant Source Control
EQ Credit 6.1, Controllability of Systems, Perimeter
EQ Credit 6.2, Controllability of Systems, Non-Perimeter
EQ Credit 7.2, Thermal Comfort, Permanent Monitoring System
EQ Credit 8.1, Daylight & Views, Daylight 75% of Spaces
EQ Credit 8.2, Daylight & Views, Views for 90% of Spaces

Innovation and Design Process, 5 of 5 possible points

ID Credit 1.1, Innovation in Design "Exemplary Performance MRc4"
ID Credit 1.2, Innovation in Design "Exemplary Performance MRc5.1"
ID Credit 1.3, Innovation in Design "Exemplary Performance MRc5.2"
ID Credit 1.4, Innovation in Design "International Green Building Assessment"
ID Credit 2, LEED® Accredited Professional

Green Building Challenge in 2002; achievement level: 2.7 in GB Tool 1.76



previous topic:

[Images](#)

next topic:



[Lessons](#)

Case Studies hosted and managed courtesy of
[BuildingGreen, Inc.](#)
Case Studies Database provided by the U.S. Department
of Energy's
[Building Technology Program, High Performance
Buildings.](#)



[About USGBC](#) | [Policies & Guidelines](#) | [Frequently
Asked Questions](#) | [Contact](#)

Copyright © 2008 U.S. Green Building Council. All Rights
Reserved.